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however, given a very readable general survey of a very large and complex problem. Written in untechnical terms, the general reader especially will find it an enlightening presentation of the financial angle of modern warfare. Furthermore, an estimation of the economic cost of war, although subject to unwarranted use in some specific applications as has been pointed out, nevertheless is worth while because of the force with which the stupendous total strikes the imagination as one of many reasons for the abolition of war.

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*Report on the Pandemic of Influenza, 1918-1919.* Ministry of Health of Great Britain. H. M. Stationery Office, 1920. Pp. 577.

Our members will be interested in the material given in this report on the epidemiology of influenza, especially in view of the statement that "the epidemiological features of the pandemic are even more complex and puzzling than the clinical characteristics, and the present report does little more than present a large body of data which await interpretation" (p. xii). American statisticians can join with their British brethren in developing methods of analysis which express the outstanding characteristics of the data. They may help the epidemiologists in arriving at concise descriptions of the epidemic course and allied characters. The epidemiologists are not satisfied with any of the theories so far advanced as explanations of the pandemic. "We have passed, it is true, from the former theories regarding origin—the miasmatic theory, the telluric and climatic theories; the importation theory; or the idea that influenza is a specific disease like anthrax, arising and progressing within narrow and definitely circumscribed limits. These are hypotheses no longer confidently held. They do not answer the fundamental questions raised by the pandemic through which we have passed." Some of the features of the pandemic in its local and general phases which seem to require newer and better statistical measures and aids to interpretation are:

#### A. DESCRIPTIVE AND ANALYTIC EXPRESSIONS FOR WAVE-FORMS

The data to be handled comparatively are the facts of (1) periodicity, (2) case-incidence, and (3) case-fatality. At present all that can be concluded is that "the broad facts remain that the epidemic presented three waves and that they differed in form. The first, short, sharp and high; the second, slower in formation, flatter, higher and more destructive of life; the third, also slow in formation, lower, more prolonged in decline, and partially reverting to the older influenzal form—a condition of things which suggests a biological factor modified by environment, but not, unhappily, directly controllable by human agency" (p. xiii).

#### B. MEASURES OF "EXPLOSIVENESS" OR EPIDEMICITY, RAPIDITY OF EXTENSION, DIRECTION OF PANDEMIC COURSE

Professor Raymond Pearl, of the Johns Hopkins University School of Hygiene, in his *Influenza Studies* I, II, III, and IV, has suggested several measures of

explosiveness or epidemicity, and these may be found useful in the analysis of the British data. (*U. S. Public Health Reports*, Aug. 8, 1919, and Feb. 18, 1921.)

#### C. EXPRESSIONS FOR AGE-TYPE OF INFLUENZA PREVALENCE

Some concise descriptive expressions are needed to establish by "type" the peculiar behavior of influenza in the several age-ranges, as a means of comparison with endemic influenza, or with the pandemics of other years. Such measures would be useful in comparing the several age characteristics of "waves" of the 1918-19 invasion.

#### D. MEASURES OF CONTINGENCY AND RELATIONSHIP

"Even in a world-wide pandemic the problem of epidemic influenza may be largely an internal problem of each nation, a problem of social relationship, of social factors, of domestic habit and life. The materials of the conflagration came from within." These measures must be adapted, also, to the consideration of the following questions:

1. Are the epidemiological features of the cycle of years within which influenza explodes different from those of the influenza-free cycles?
2. Preceding influenza epidemics, is there a rise in general morbidity of the population, an "epidemic constitution" favorable to influenza? Are there often mild and atypical clinical forerunners of the disease, and parallel or allied clinical maladies? Are influenza pandemics focal points in a system of related phenomena?
3. Are there concurrences, similarities, and inter-relationships between outbreaks of cerebro-spinal fever, poliomyelitis, and outbreaks of influenza, bronchitis, and pneumonia?

#### E. TESTS FOR THE RELIABILITY OF DATA FOR SMALL GROUPS

Numerous experiments in vaccination against influenza have been made. Some control should be exercised over the data for the smaller groups. Some data are available also for the results of treatment for selected, but small, hospital and domiciled populations. These too must be tested by suitable measures for degree of validity of the crude results.

These are a few of the points of contact between statisticians and epidemiologists with respect to analysis of influenza data. Interest in influenza pathometry seems to have flagged in recent months; the enthusiasm for analysis of influenza data has disappeared. But with the publication of volumes such as the one under review, a renewal of inquiry into the higher statistical characteristics of influenza may follow.

Chapter I, on the history of influenza in Great Britain, will repay reading and thoughtful consideration. Much of the text is devoted to a development of the Sydenham and Huxham observations of influenza in the seventeenth and eighteenth centuries. One feels convinced, after due reflection upon the material in the chapter, that with respect to influenza, we are not entirely through with parts of Sydenham's doctrine of epidemic constitutions.

A closer examination of recent events is given in Chapter II. The "epidemic constitution" theme is taken up. The authors state that "it is prudent not to advance beyond the point . . . that before the influenzas of 1918-19 the quality of diseases affecting the population of this country was abnormal" (p.

36). They quote the opinions of Dr. Hamer and Dr. Crookshank "that the association or juxtaposition of cerebro-spinal fever, polio-encephalomyelitis, the Heine-Medin complex and epidemic influenza is not fortuitous, but may be well founded." Certain observations follow on the epidemic in England and Wales, in Scotland, and in Ireland. A discussion of the forms of epidemic curves (p. 55) contains this statement of interest to statisticians:

Great improvements in the art of curve fitting and the graphical representation of mathematical formulae expressing biological laws or ways of happening . . . have permitted the hope that by analysis of epidemic curves, light may be thrown upon the genesis of the epidemic. The subject has not, however, yet been sufficiently developed to permit the realization of these hopes in the present connection. Upon the whole . . . the balance of probability inclines to the view that the *materies morbi* itself underwent an evolution similar in form to, but more rapid than, the life cycles of flux and reflux, which, Dr. Brownlee has contended, are principal factors of varying epidemicity. Some light may be thrown upon this by harmonic analysis directed to disclose periodicities of incidence.

At the close of this chapter there is a discussion of the epidemic curves for three British ships. There is a suggestion that if some method of resolving compound epidemic curves into monomodal components were at hand, certain valuable epidemiological observations could have been made.

Chapter VII contains some skillful handling of weather and respiratory disease mortality data. The methodological blunders of students of physiological meteorology in our own country are avoided, and due credit is given to Farr's original work on the subject.

Dr. R. Bruce Low contributes a valuable collection of data on the influenzas in Europe and in the Western Hemisphere in Part II of the volume (pp. 202-348).

Part XII of the Appendix, a note on the periodicity of influenza, by Dr. John Brownlee, concludes the volume. This note expands Dr. Brownlee's short article on the same subject in the London *Lancet* (November 8, 1919). He reiterates his statement that influenza tends to recur in 33 week cycles, as determined by his application of the "periodogram," a device he borrowed from the physicists. Replying to some criticism of his *Lancet* article, he reinforces his former arguments by a study of the Boston, Massachusetts, figures for the influenzas prevailing between 1889 and 1900. Here he finds a rigid periodicity of 33 weeks.

This collection of British data should be read in connection with Dr. Warren T. Vaughan's "Influenza: An Epidemiology Study," published in the *American Journal of Hygiene*, Monograph Series No. 1, July, 1921.

E. W. KOPF

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*Official Statistics: What They Contain and How to Use Them.* By Arthur L. Bowley, Sc.D., Professor of Statistics in the University of London. Humphrey Milford, Oxford University Press. 1921. Pp. 63.

One's first reaction on examining this little book of sixty-three pages, with less than four hundred words on a typical page, is a sense of disappointment that it is not for trained students of economics and statistics. They would